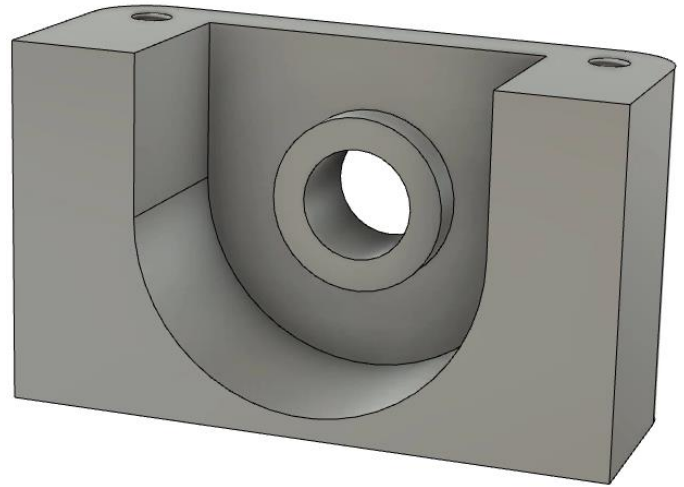


Create a 3D model from a blueprint

In this module, you'll begin modeling a component using specs from a blueprint.

Learning objectives:

- Review a blueprint.
- Create sketches and features to reproduce a design.
- Verify a design.



The completed exercise

1. Upload and open the supplied *Engine Case RH – No Timeline.f3d* and *Engine Assembly - Intro to CAD/CAM CNC.f3d* files.

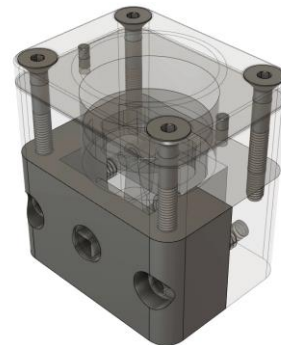


Figure 1. Upload and open the supplied files

2. In the Engine Assembly - Intro to CAD CAM CNC tab, click and drag the crankshaft's end piece shown in the image on the right and notice that the piston is allowed to reciprocate up and down inside the cylinder.

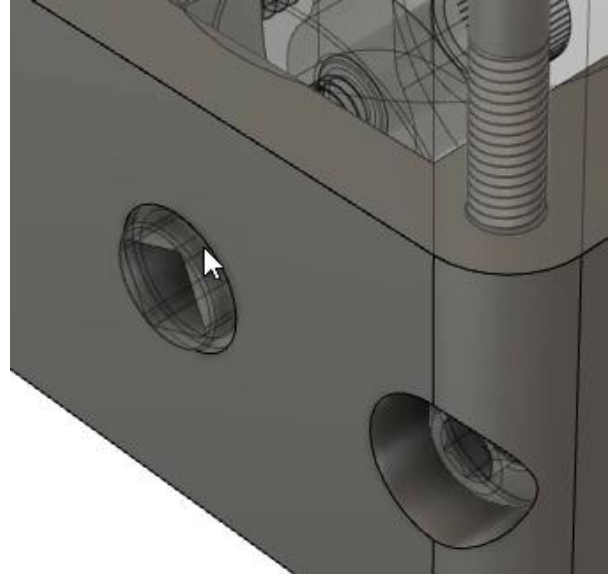


Figure 2. Move the piston

3. Return the piston to its original position by clicking Position> Revert.

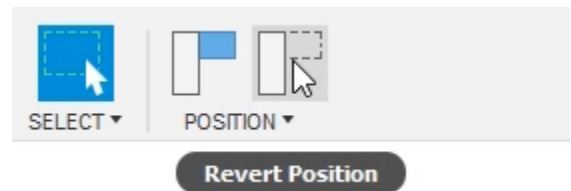


Figure 3. Revert the piston to its original position

4. Open the supplied *Engine Case RH - Drawing ENG-1008.pdf* file and notice all the useful information needed to create the right half of the engine case. Make sure this document is accessible because its information will be used to help create the model for manufacturing the engine case. If you don't have a second monitor to leave this file open, you can screenshot the PDF, save it as an image, then insert it into your projects for easy reference.

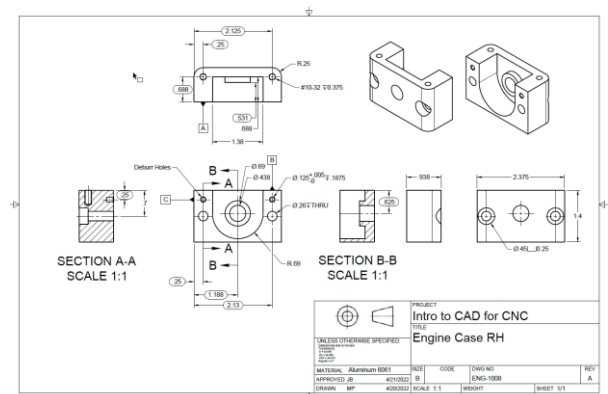


Figure 4. Open the part's blueprint

5. Create a new design by clicking the plus icon shown in the image on the right.

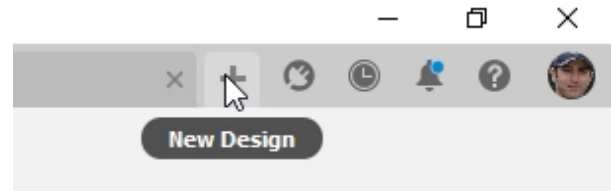


Figure 5. Create a new design

6. Use the Browser's Change Active Units to set the design's units to inches.

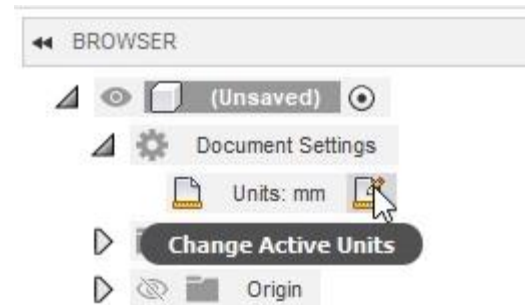


Figure 6. Change the units to inches

7. Click Insert> Canvas.



Figure 7. Insert a canvas

8. Navigate to the data set supplied with the course and locate the Engine Case RH – Drawing Image. Open this image.

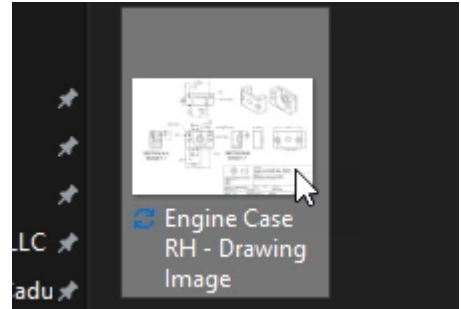


Figure 8. Open the supplied image

9. Place the image onto the XZ plane, then OK the Canvas dialog. The selected image is inserted into the design on the XZ plane.

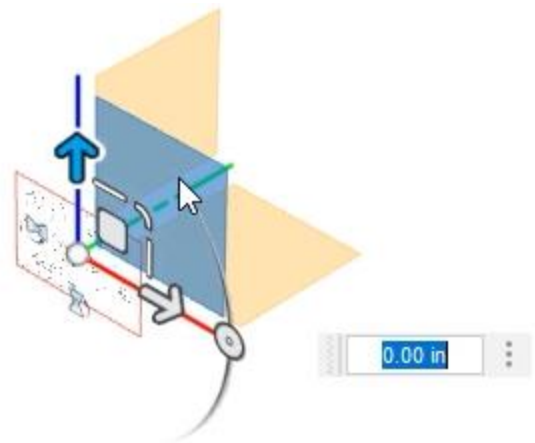


Figure 9. Choose the XZ plane

10. To make sure the image is scaled properly, expand the Canvases folder, right-click the image, then choose Calibrate from the menu.

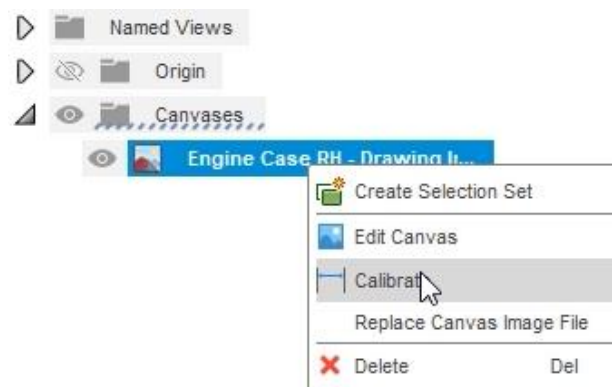


Figure 10. Scale the image

- 11.** Select two points on the image that are a known distance apart. Notice that the two selected points are not the appropriate distance apart; the drawing says they should be 2.13 inches but the actual measurement is 0.09 inches.

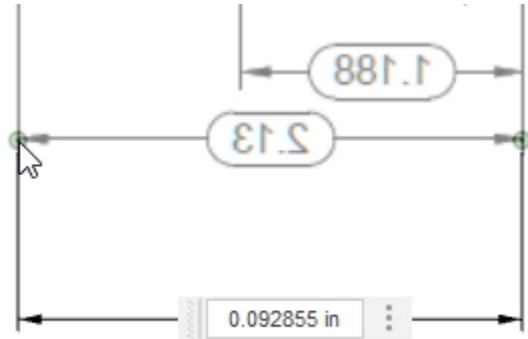


Figure 11. Select two points

- 12.** Enter the appropriate dimension into the dimension box, then press Enter.

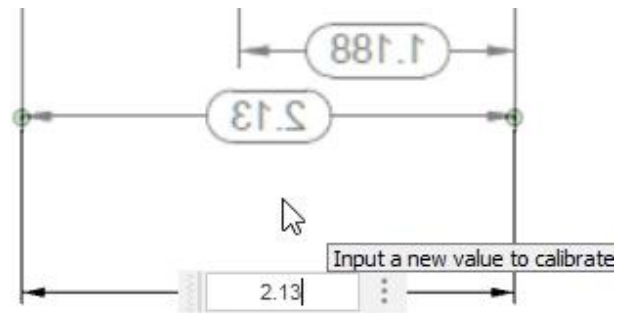


Figure 12. Enter the appropriate dimension

- 13.** Right-click the image and choose Edit Canvas.

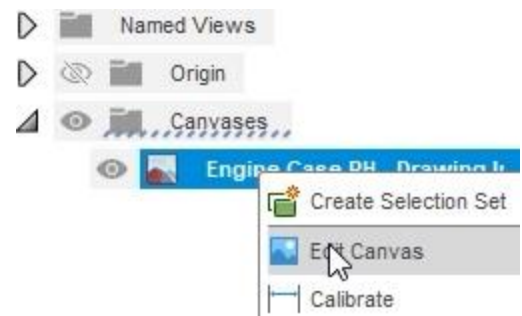


Figure 13. Edit the Canvas

- 14.** The image is currently backwards and needs to be flipped; activate the dialog's Horizontal option, then OK the dialog.



Figure 14. Flip the canvas

- 15.** Edit the Canvas one more time and drag the canvas away from the origin. OK the dialog. This is a way to leave the dimensions visible as you work on a model if you don't have a second screen for your PDF. Choose whether you want to leave these dimensions visible in the Fusion 360 file, use a printout of the dimensions, or work off of a second monitor.

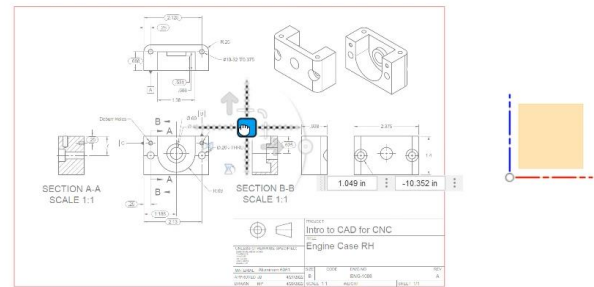


Figure 15. Move the canvas to a new location

- 16.** For the purposes of this documentation, the PDF will be visible on a second monitor and the canvas will be hidden. If you choose to do the same, turn off the visibility for the Canvas by clicking the eyeball icon next to the Engine Case RH - Drawing Image. Also turn off the visibility for the Browser's Origin folder.

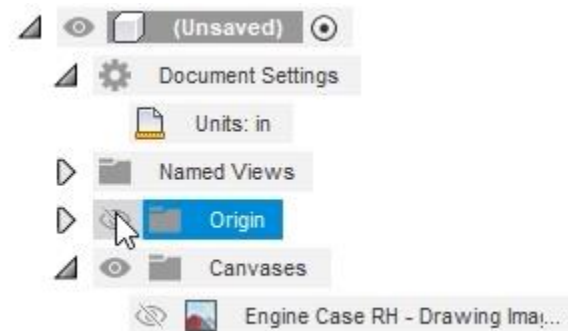


Figure 16. Hide the origin

- 17.** Click Create> Create Sketch, then choose to sketch on the XZ Plane.



Figure 17. Create a new sketch

- 18.** Click Create> 2-Point Rectangle.

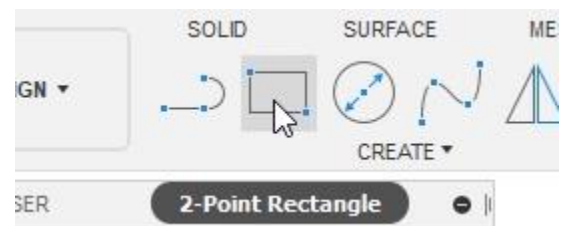


Figure 18. Open the 2-Point Rectangle tool

- 19.** Inside the Sketch Palette dialog, activate the Center Rectangle option.

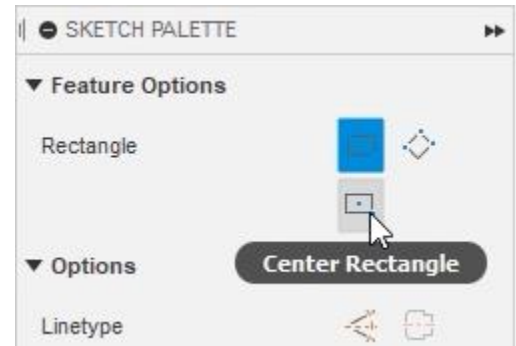


Figure 19. Activate the Center Rectangle option

- 20.** Click the sketch's origin to place the center of the rectangle, then move your cursor away from the origin. Enter **2.375 inches** into the width dimension box, then enter **1.4 inches** into the height dimension box. Press Enter to create the rectangle.

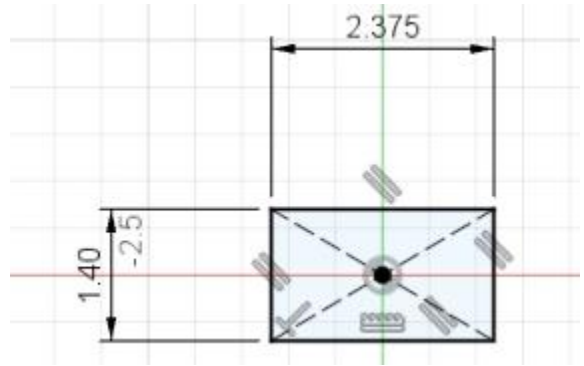


Figure 20. Draw a rectangle

- 21.** Click Finish Sketch> Finish Sketch to end the current sketch.



Figure 21. Finish the sketch

- 22.** Click Create> Extrude to open the Extrude tool.



Figure 22. Open the Extrude tool

- 23.** Choose the Symmetric option from the dialog's Direction menu, then activate the Whole Length option in the Measurement section. Enter **0.938 inches** into the Distance box, then OK the dialog.

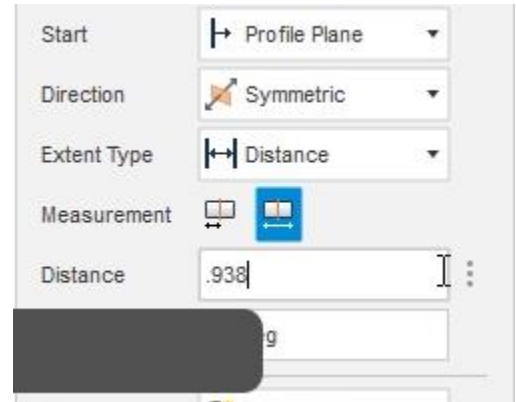


Figure 23. Choose the extrude's settings

- 24.** The basic block for the engine case is now created.

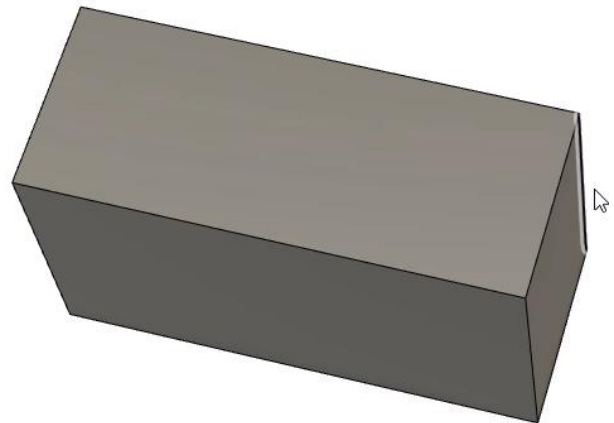


Figure 24. Inspect the result

- 25.** Click Modify > Fillet.

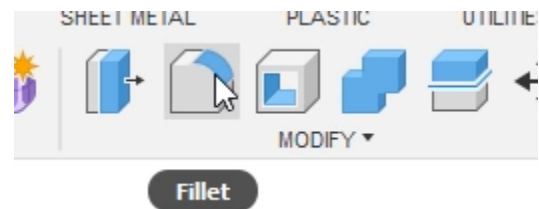


Figure 25. Open the Fillet tool

- 26.** Select the two edges shown in the image on the right, then add a 0.25-inch radius fillet to them. OK the Fillet dialog.

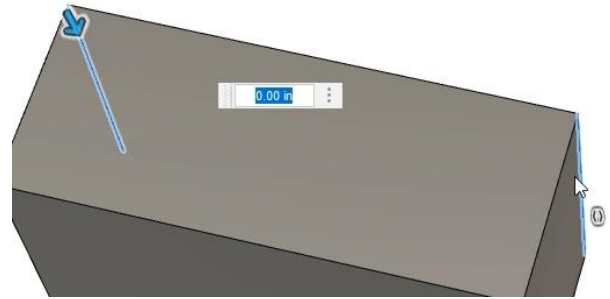


Figure 26. Create the fillets

- 27.** Inspect the result to make sure it matches the measurements shown on the blueprint.

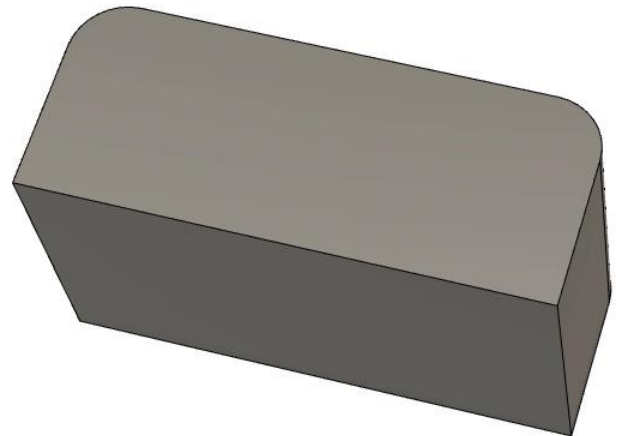


Figure 27. Inspect the result

- 28.** Select the solid body's top face, right-click it, then choose Create Sketch from the menu.

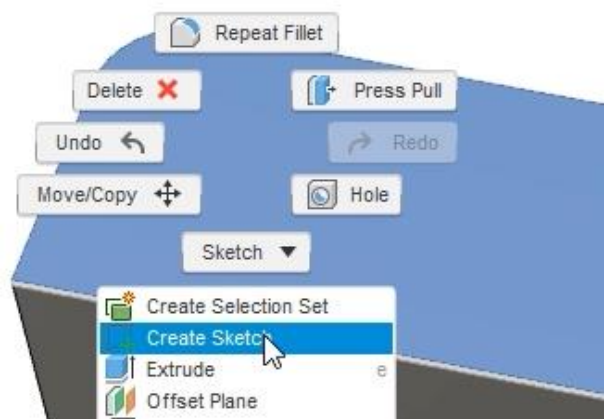


Figure 28. Create a new sketch

29. Click Create> Point.

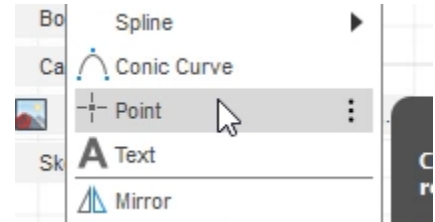


Figure 29. Open the Point tool

30. Place two points on the solid body's top face, one near each filleted corner.

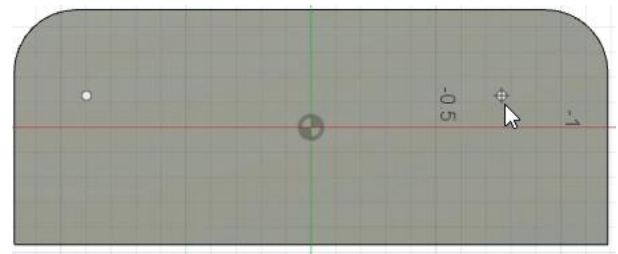


Figure 30. Place two points

31. Press D to open the Dimension tool and add the two dimensions shown in the image on the right.

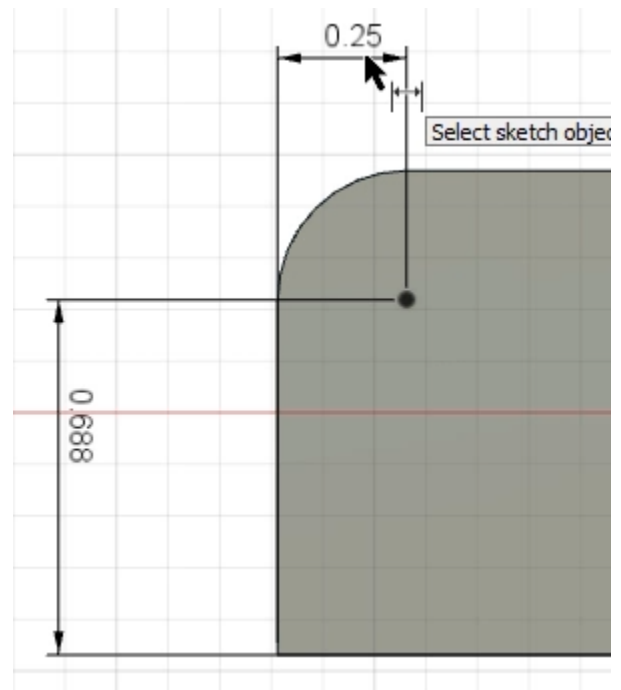


Figure 31. Dimension one of the points

- 32.** Add a dimension of 2.125 inches between the edge you used in the previous step and the second point.



Figure 32. Dimension the second point

- 33.** Add a Horizontal constraint between the two points by clicking Constraints> Horizontal/Vertical, then selecting the two points. The two points turn black to indicate they are fully defined. Finish the sketch by clicking Finish Sketch> Finish Sketch.

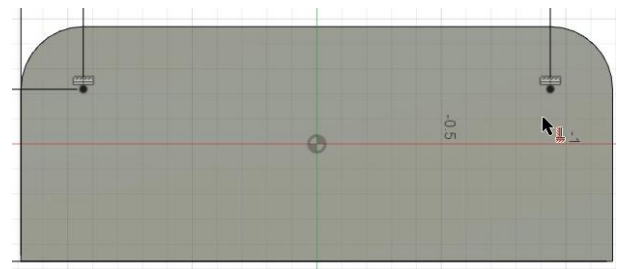


Figure 33. Fully define the points

- 34.** Click Create> Hole.

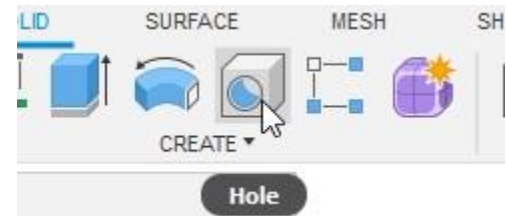


Figure 34. Open the Hole tool

- 35.** In the Hole dialog, activate the From Sketch (Multiple Holes) option in the Placement section.

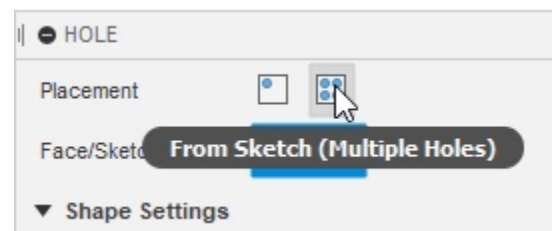


Figure 35. Choose the hole placement type

- 36.** For the dialog's Sketch Points selection, choose the two points. Don't be alarmed if the previews look much larger than the solid body.

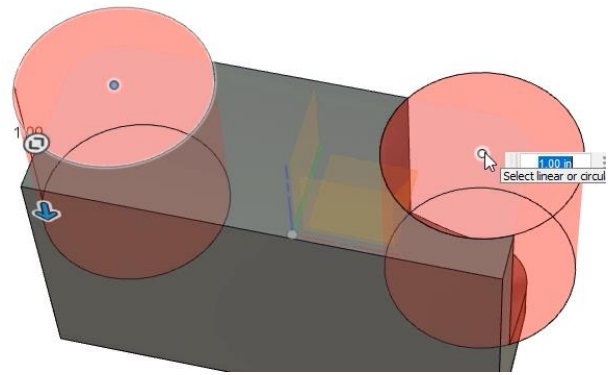


Figure 36. Choose the Sketch Points selection

- 37.** Configure the hole's settings to match the image shown on the right.



Figure 37. Configure the hole's settings

- 38.** Use the information on the blueprints to help configure the hole's parameters, then OK the dialog to create the threaded hole.

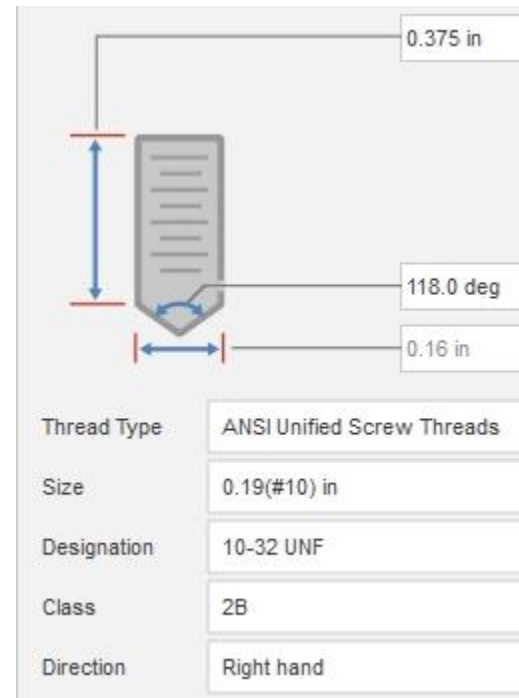


Figure 38. Configure the hole's parameters

- 39.** Create a new sketch on the face shown in the image on right.

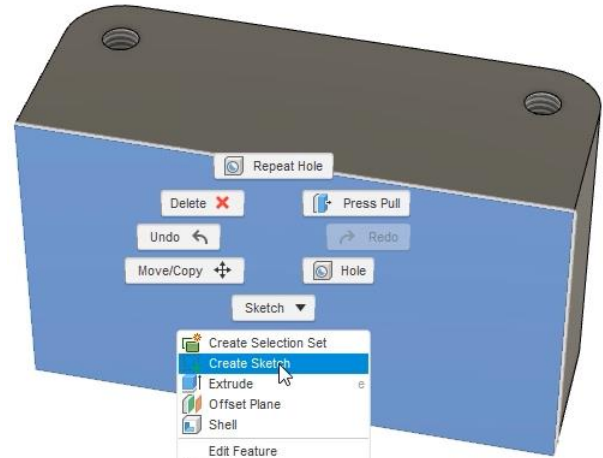


Figure 39. Create a new sketch

- 40.** Open the Circle tool and draw three concentric circles below the sketch's origin.

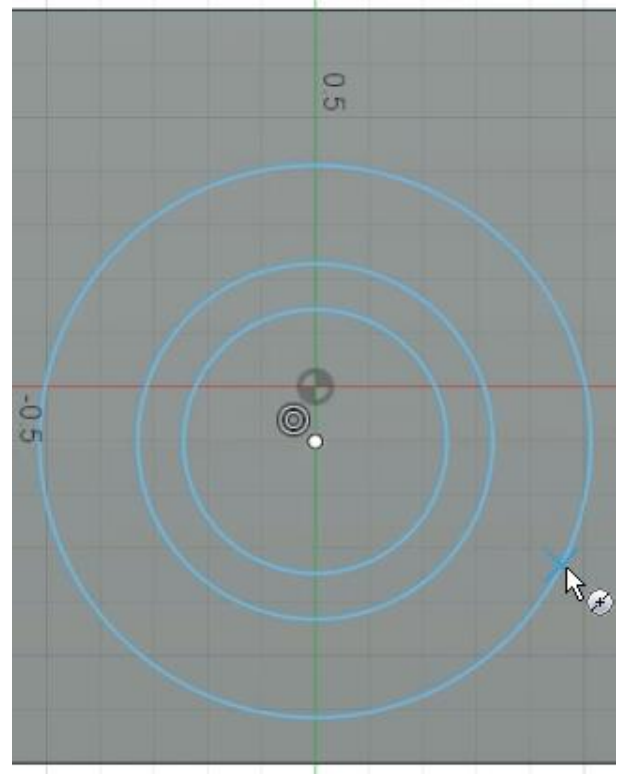


Figure 40. Draw three concentric circles

- 41.** Press D to open the Dimension tool and use the measurements from the blueprints to dimension the two smaller circles.

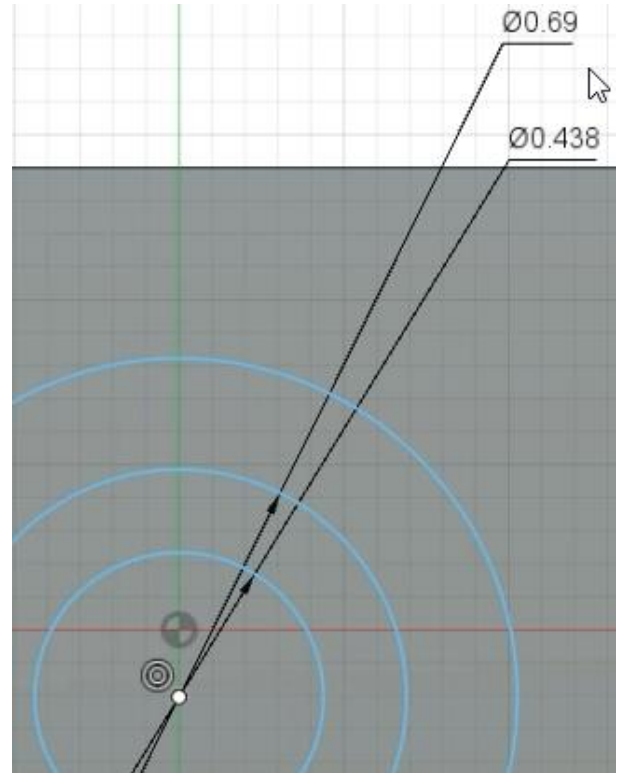


Figure 41. Dimension two circles

- 42.** Add a dimension to the largest circle but right-click in the Canvas area before placing the dimension. Choose the Radius option from the menu so that the dimension will describe the radius instead of the diameter.

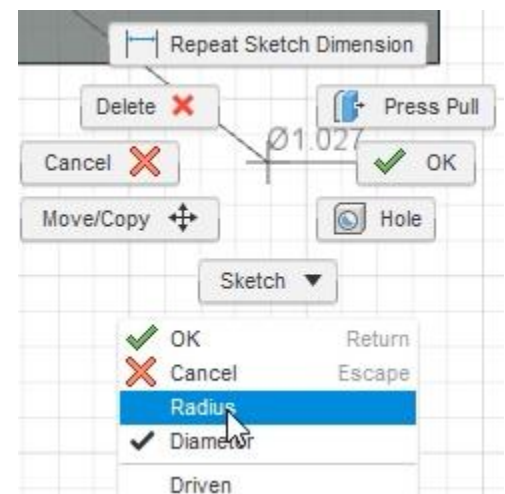


Figure 42. Create a radius dimension

- 43.** Use the information from the blueprint to describe the largest circle's radius. Press Esc to leave the Dimension tool.

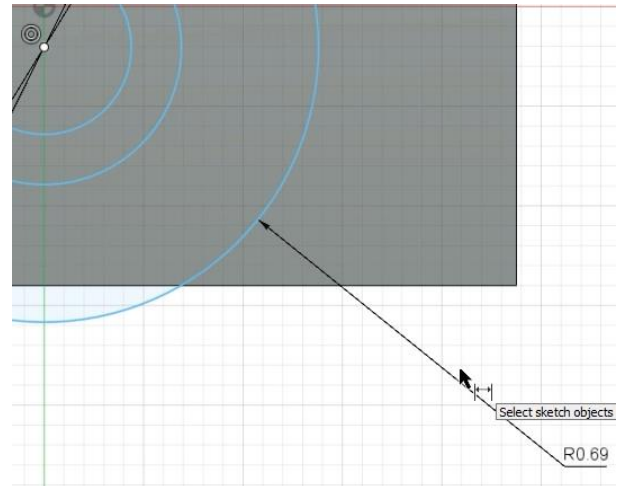


Figure 43. Dimension the largest circle

- 44.** Using the blueprint as a guide, continue to add dimensions until the circles are fully defined.

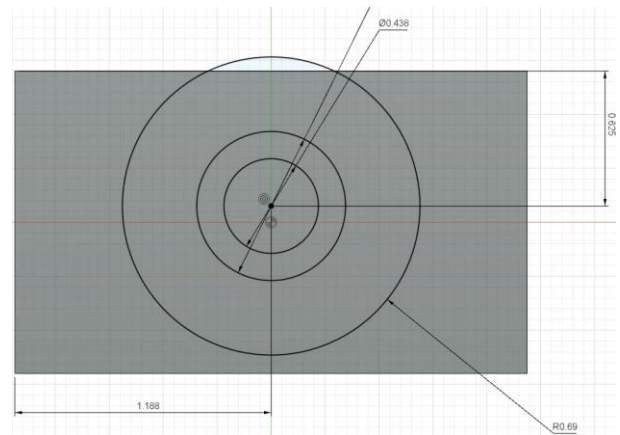


Figure 44. Fully define the circles

- 45.** Press L to open the Line tool and draw two vertical lines to connect the largest circle to the body's top edge.

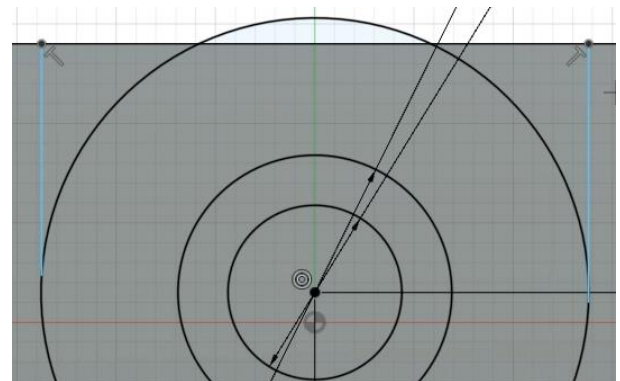


Figure 45. Draw two vertical lines

46. Click Constraints> Tangent.



Figure 46. Open the Tangent tool

47. Select the vertical line you drew in Step 45 and the larger circle to add a Tangent constraint between them. Repeat this process for the other vertical line. The lines will turn black to indicate they are fully defined. Finish the sketch.

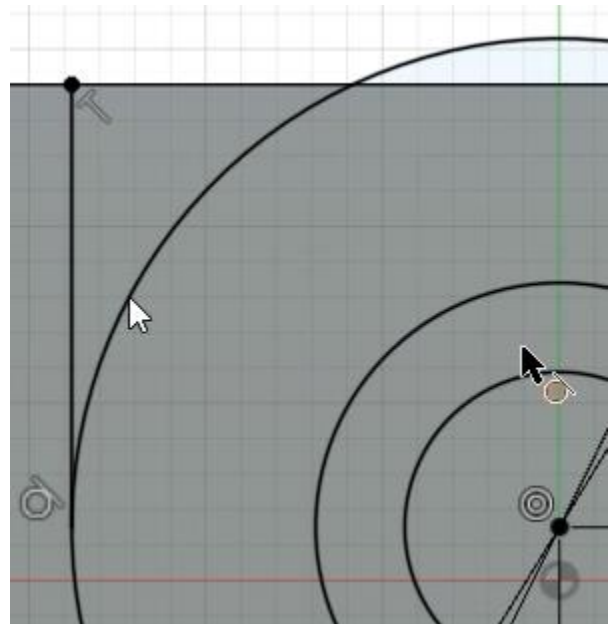


Figure 47. Fully define the vertical lines

- 48.** Press E to open the Extrude tool, then select the three sketch regions shown in the image on the right.

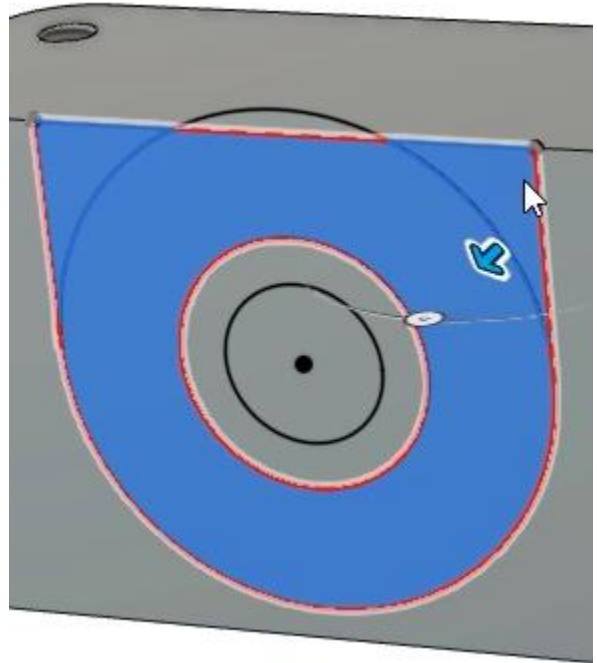


Figure 48. Select the sketch regions to extrude

- 49.** Use the on-screen manipulator to drag backwards through the selection - 0.688 inches. OK the Extrude dialog to remove the material from the body.

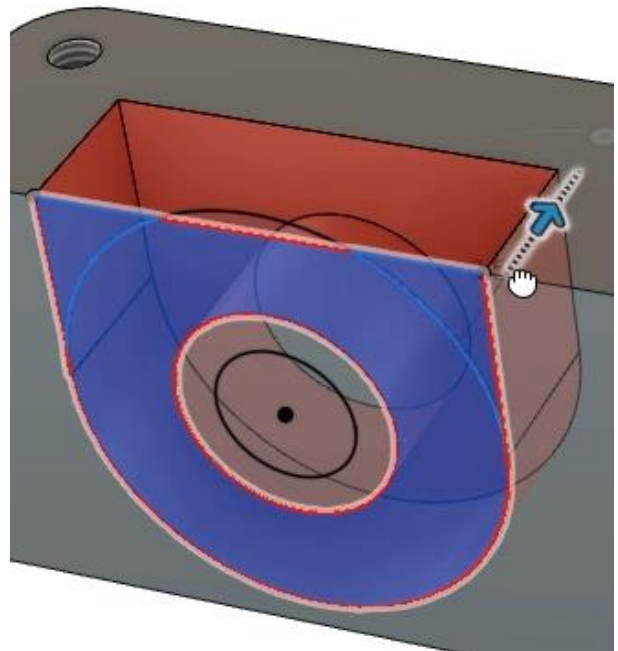


Figure 49. Remove material from the body

- 50.** Expand the Browser Sketches folders and turn on the visibility for Sketch3.



Figure 50. Show the sketch

- 51.** Select the sketch region shown in the image on the right, then press E to open the Extrude tool.

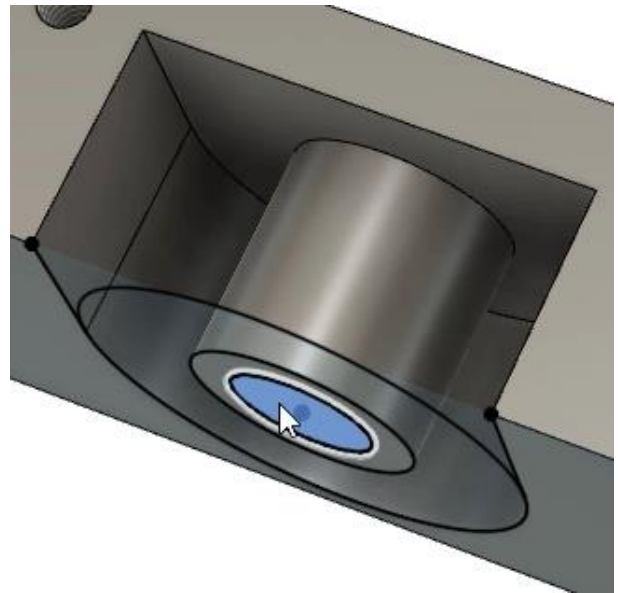


Figure 51. Select the region to extrude

- 52.** Choose the All option from the dialog's Extent Type menu, then OK the dialog.

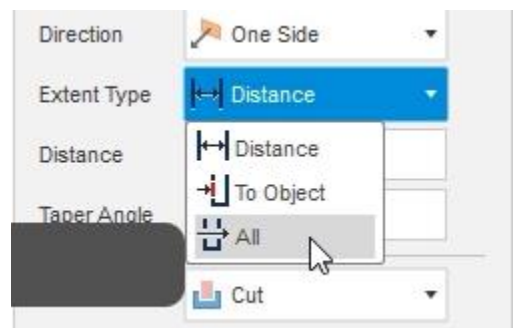


Figure 52. Choose the extrude's extent type

- 53.** Select the sketch region shown in the image on the right, then press E to open the Extrude tool.

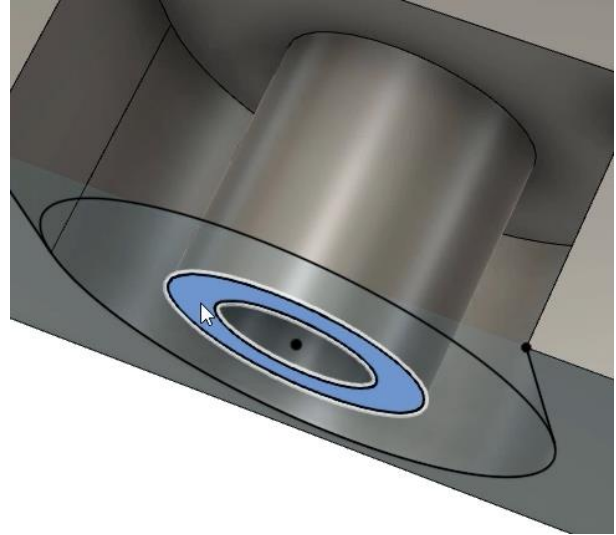


Figure 53. Select the region to extrude

- 54.** Drag the on-screen manipulator backwards to the part, then enter -**0.531** into the dialog's Distance box. OK the dialog to shorten the boss height.

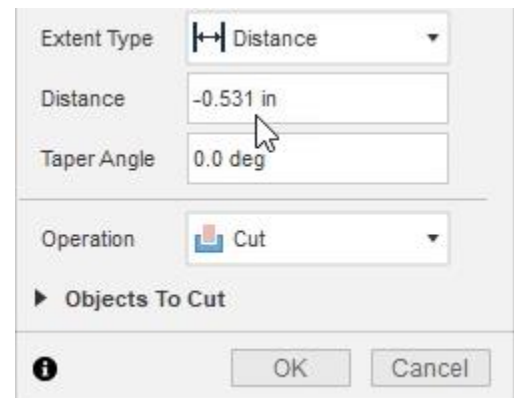


Figure 54. Remove material from the body

- 55.** Turn off the visibility for the sketch.

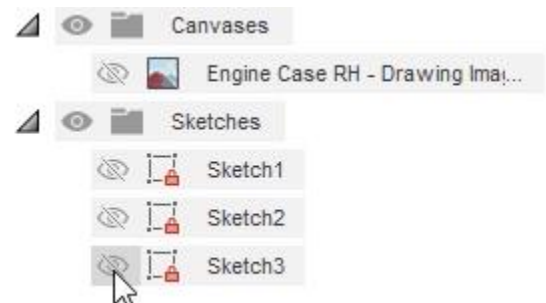


Figure 55. Hide the sketch

56. Save the file and name it **Engine Case RH**. Continue to the next module.

Save

Name:

Engine Case RH

Location:

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Figure 56. Save the file